

Research Note 84-39

AN EXPERIMENTAL DEMONSTRATION OF THE EFFECTS OF EXPECTANCY THEORY  
VARIABLES ON WORK BEHAVIOR

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Theory, expectancies, instrumentalities, and valences, and found subsequent changes in perceptions and performance. This report is first in a 1975-1976 series entitled "Sources and Effects of Accurate Work Perceptions."

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## An Experimental Demonstration of the Effects of Expectancy Theory Variables on Work Behavior

The plethora of articles on Expectancy Theory over the last decade attests to its appeal for the study of work motivation. Unfortunately, the increased interest in the model has not led to an increase in its demonstrated utility (Mitchell, 1974). Early researchers reported correlations between motivation (force) as defined by Expectancy Theory variables and performance and effort which ranged from zero to around .40 (see, for example, Gailbraith and Cummings, 1967; Graen, 1969; Hackman and Porter, 1968). With few exceptions, more current research based on some modifications of the original Expectancy Theory model has failed to improve upon the strength of this motivation - behavior relationship when motivation is measured by the model and performance and effort are based upon some criteria other than the participant's own subjective estimate of his behavior level.

On the one hand, the consistency of these results over many work settings, subject populations, and operationalizations of the major variables provides support for this theory. On the other hand, the low-grade correlations usually obtained in these studies raise doubts about the theoretical utility of the Expectancy Theory model.

These doubts are increasingly appearing in the published literature. Since 1971, no less than nine review articles have appeared (Behling, Schriesham, and Tolliver, 1973; Behling and Starke, 1973; Campbell and Pritchard, 1975; Miner and Dachler, 1973; Heneman and Schwab, 1972; Mitchell, 1972; Mitchell, 1974; Mitchell and Biglan, 1971; Whaba and House, 1974). The criticisms raised by these reviewers range from methodological and measurement problems with the research to conceptual problems of the model itself. Further, the reviewers differ with respect to their recommendations for future research. While all agree that more rigorous research

and measurement must precede a better understanding of Expectancy Theory, some go as far as to suggest that researchers are too optimistic about the human being as a decision-maker with respect to Expectancy Theory variables, and they suggest a need to "detune" the model in accord with man's limited decision-making capacities. Other reviewers suggest that a more precise, elaborate model be specified in order to account for more behavioral variance.

### The Direction of Causality

One commonality among researchers and reviewers alike is the acceptance of the causal link suggested by Expectancy Theory. People are said to make decisions about their effort expenditure based on their perceptions of their environment and their preferences for outcomes obtainable in the environment. In other words, Expectancy Theory beliefs are said to cause one's behavior to become activated, directed, and sustained to some degree. While this is a necessary and understandable assumption of the cognitive theory of motivation, only a few studies have attempted to address it by using a research design appropriate to making causal inferences.

Typically, studies done to test Expectancy Theory have employed a survey methodology and correlational design. The major components of the model are measured by questionnaires, the scores are combined according to the dictates of the model, and the resultant composites are then correlated with measures of work behavior. Results based on this correlational approach are only able to indicate the degree of relationship between motivation and work effort and motivation and work performance. Since most attempts to demonstrate the utility of the Expectancy Theory model have been of that sort (i.e., correlational), it becomes difficult to assess the causal effects Expectancy Theory variables have on work behavior.

Two research strategies have been used to address the issue of causality. The first approach involves a cross-lagged correlation. As with typical survey designs,

Expectancy Theory variables are assessed with questionnaires, the scores are combined in an appropriate fashion, and the composites correlated with measures of work behavior. Unlike cross-sectional correlational designs, both the Expectancy Theory and criterion variables are assessed at two points in time. Expectancy Theory composites are then correlated with measures of immediate work behavior (Time 1) and with both Expectancy Theory composites and work behavior measured at a later time (Time 2).

The literature contains two studies which have used this design (Lawler, 1968; Lawler and Suttle, 1973). Lawler (1968) measured Expectancy Theory variables and performance of a group of 55 managers at two points in time separated by one year. The performance criterion consisted of self-, peer-, and supervisor-rankings of job performance. The pattern of cross-lagged correlations was similar for each criterion and indicated that the Expectancy Theory composite (Time 1) - performance (Time 2) correlations generally were greater than the performance (Time 1) - Expectancy Theory composite (Time 2) correlations. In all cases, the former correlations were significant, while the latter was significant only for self-rated performance. The concurrent correlations between these variables showed no consistency across the three analyses.

Lawler and Suttle (1973) collected Expectancy Theory measures as well as both effort and performance criteria from a group of 69 retail store department managers at two points in time. For half the sample, the second measurement occurred after six months; for the rest, after one year. As with the Lawler (1968) study, the criteria were self-, peer-, and supervisor-rankings. The results indicated no support for the motivation-causes-behavior hypothesis using the performance criteria. For the effort data, only self- and supervisor-rating showed the proper patterning of correlations, and these only for the six-month time delay group.

4

Across both studies, only moderate support has been given to the Expectancy Theory variables-cause-behavior hypothesis. As Mitchell (1974) has pointed out, while only moderate support was offered for the assumed direction of causality, at least only very little support was given for the opposite direction of causality.

Since both cross-lagged studies employed rather long time lags (six months and one year), it is difficult to conclude either support or non-support from these data. On the one hand, the low Expectancy Theory composite (Time 1) - effort rating (Time 2) correlations may be due to changes in the work environment over the time-lag period, and not due to the failure of the theory to predict effort (Mitchell, 1974). On the other hand, it is surprising that Expectancy Theory variables should be significantly correlated with effort measured as far away in time as one year. Most researchers would argue that motivation as defined by this model is an immediate antecedent of behavior. The significant correlations over six and 12 month time periods imply a stable work environment, and thus, stable antecedent-consequent conditions. This assumption, however, negates the point made above that the low level of the correlations themselves can be explained by a changing work environment. Thus, conclusions about causality based on the cross-lagged correlational studies must be made with caution. At best, these results are only suggestive of the assumed direction of causality.

The second major research strategy, the experimental method, is particularly well-suited for addressing questions of causality. Variables hypothesized to affect behavior can be systematically manipulated in a controlled situation to determine if they act as immediate antecedents of behavior. Five investigations have applied this method to the study of Expectancy Theory. These studies involved the experimental manipulation of either one or two of the three major Expectancy Theory variables; in no case were all three variables manipulated.

Arvey (1972) and Motowidlo, Dunnette, and Loehr (1973) conducted highly similar laboratory studies. Arvey (1972) had subjects work on a series of simple arithmetic tasks for 20 minutes under specific expectancy and instrumentality instructions. They were told that either 20, 50, or 75 percent of them would be successful on the task (expectancy manipulation) and that either 25 or 75 percent of the high performers would obtain a valent outcome (instrumentality manipulation). Motowidlo et al. (1972) had subjects work on the same task under the same expectancy conditions. Using an objective measure of performance as the dependent variable, both studies reported a significant main effect for the expectancy variable (Arvey,  $p < .06$ ; Motowidlo et al.,  $p < .002$ ). Arvey (1972) found neither a significant instrumentality main effect nor an expectancy x instrumentality interaction.

Pritchard and DeLeo (1973) and Jorgenson et al. (1973) also conducted highly similar studies. Both studies simulated a real organization and had subjects work on a catalog task. This task required subjects to transform a series of catalog numbers according to a specific formula, locate the corresponding price for each, and then record this price on worksheets. Performance on this task was the number of items completed within a specified time period. In addition, measures of effort were taken.

In the Pritchard and DeLeo study, subjects worked on the task under a piece-rate or hourly pay schedule (instrumentality manipulation) for either \$1.75 or \$2.50 per hour (valence manipulation). The results of this study indicate significant main effects for the instrumentality and expectancy variables for both the performance and effort measures and a significant instrumentality x valence interaction. However, the pattern of cell means was opposite to that predicted by Expectancy Theory. The greatest performance was exhibited by subjects in the high instrumentality - low valence condition. Likewise, for the effort data, subjects in the low valence condition exerted greater effort than their counterparts in the high valence condition.



Jorgenson et al. had subjects work for three days under both a high and low performance - reward contingency (instrumentality manipulation) in a counter-balanced design. Their results indicated a strong instrumentality effect for performance ( $p < .001$ ), but not when self-rated effort was the dependent variable.

Graen (1969) also simulated a real organization. Subjects worked on two tasks of a similar nature in this study. The first task required subjects to search through computer printouts for specified numbers and then transcribe these numbers on a separate sheet. The second task was identical to the first with the added requirement of rounding off the numbers before transcription according to a specified decision rule. For both tasks, the number of items attempted was the performance measure. Subjects worked on these tasks in one of three conditions which defined the instrumentality manipulation. They either received achievement feedback which was contingent on their performance, a salary increase which was non-contingent on their performance, or neither achievement feedback nor money. Expectancy Theory force scores were computed for each subject and correlated with performance on each task and with a measure of residual gain in performance. The results indicated significant force - behavior correlations only with the residual gain in performance measure for both tasks, but only when objective instrumentalities were present (achievement feedback condition). Other force - behavior correlations did not reach statistical significance. Thus, the results of these five studies indicate support for the instrumentality variable as a determinant of both work performance (Graen, 1969; Jorgenson, Dunnette, and Pritchard, 1973; Pritchard and DeLeo, 1973) and effort (Pritchard and DeLeo, 1973). Support for the expectancy term is reported by Arvey (1972) and Motowidlo et al. (1972).

However, the pattern of these results as support for Expectancy Theory variables should be interpreted with caution. First, while significant effects were observed, failure to observe predicted effects also were reported. For example, Jorgenson,

et al. (1973) predicted, but did not find, a main effect for the instrumentality variable when perceived effort was their dependent variable. Second, Arvey (1972) and Motowidlo, Loehr, and Dunnet (1972) manipulated the expectancy variable by instructing their subjects that either 20 percent, 50 percent, or 75 percent of them would succeed in the experimental tasks. This manipulation corresponds more closely to a task difficulty manipulation than to a manipulation of an expectancy as discussed above. This is even formally stated in the Motowidlo et al. (1972) study, where one purpose of the study was to compare Expectancy Theory to Locke's (1966, 1968) theory of goal setting. These authors indicate that competing predictions are presented by the expectancy manipulation described above. To make this comparison, these authors, in effect, argue that a low probability of task success can be equated with a difficult goal and a high probability of success with an easy goal. Finally, significant effects which were contrary to Expectancy Theory predictions have been observed. Pritchard and DeLeo (1973) reported a significant instrumentality x valence interaction using performance as their dependent variable in which the cell means clearly did not conform to the predicted pattern. Using an effort measure as their dependent variable, a significant main effect for valence was observed in which the cell means were opposite to predictions made by Expectancy Theory.

In summary, these five experimental investigations provide inconclusive support for the effects of Expectancy Theory variables on work behavior. Taken together with the low-grade Force - behavior correlations of the survey methodology studies, the question of the utility of Expectancy Theory as a theory of motivation needs to be raised. As Behling and Sturke (1977) have pointed out, the possibility that causation may be in the opposite direction to that presently assumed cannot be dismissed since most of the evidence for the Force - behavior relationships is correlational. A resolution to the question of the utility of Expectancy Theory

will not be reached until it can be demonstrated that motivation, as defined by the model, is indeed a determinant of behavior. Additional correlational, survey methodology studies will not aid in this determination.

#### Present Research and Predictions

The purpose of the present research was to experimentally demonstrate the causal effects of Expectancy Theory variables on work behavior. As pointed out, those studies which have used an experimental methodology did not clearly demonstrate these effects. Further, none of these studies dealt with all three of the major Expectancy Theory variables simultaneously to determine their joint effects on work behavior.

In the present study, expectancies and instrumentalities, in addition to valences, were experimentally manipulated in a completely crossed design to determine their joint effects on behavior. The levels for each variable corresponded to (1) high versus low valence, (2) contingent versus noncontingent instrumentality, and (3) high versus low expectancy conditions.

The Expectancy Theory model predicts that a "low" value on any of the three variables negates the motivational effects of the other variables. This follows from the multiplicative nature of the model. With only one outcome, if either the instrumentality or the valence of the outcome approaches zero, then the valence of a performance level will approach zero. This, in turn, will result in a low force score, regardless of how strong an expectancy a person might have. Likewise, if a person doesn't believe that his effort is related to his performance (that is, the expectancy term approaches zero), the result will be a low force score, regardless of the valence of performance.

Figure 1 contains the predicted pattern of cell means for effort expenditure. The figure depicts no differences in effort expenditure for subjects in any cell which contains at least one "low" level on any one of the three Expectancy Theory

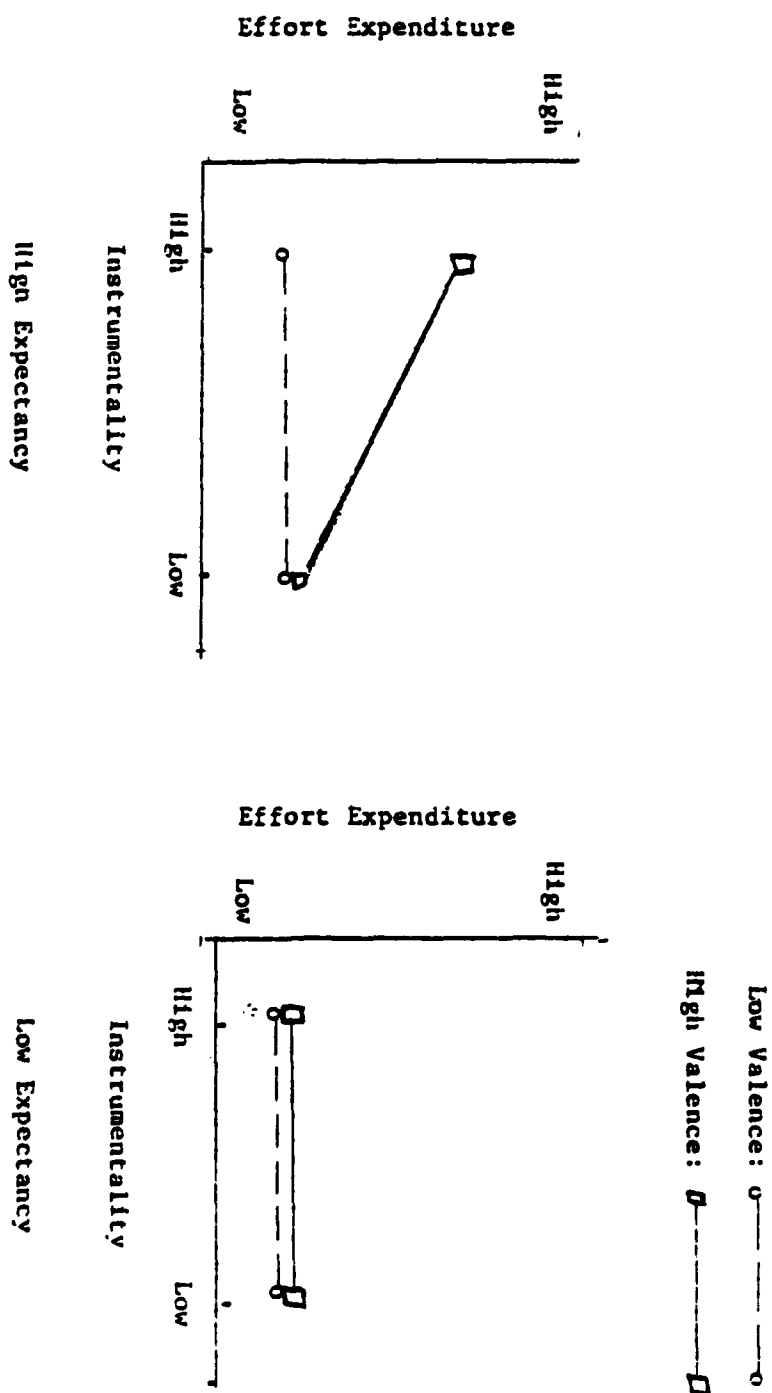


Figure 1: Predicted Pattern of Means for Effort Expenditure

variables. That is, either low expectancy, low instrumentality, or low valence is predicted to negate the motivational effects of the other two variables. On the other hand, subjects in the cell defined by a "high" level on all three Expectancy Theory variables are predicted to exert significantly more effort than subjects in any of the other seven cells.

These predictions about the pattern of cell means translate into the following statistical predictions within an Analysis of Variance design.

1. The three-way interaction should be significant. This prediction follows directly from the pattern of cell means given in Figure 1 and represents the major prediction with respect to this hypothesis. The interaction should result from a non-significant instrumentality x valence simple interaction within the low expectancy condition and a significant instrumentality x valence simple interaction within the high expectancy condition. Exploration of this latter simple interaction should result in (a) no differences in effort expenditure between the two levels of valence for subjects in the low instrumentality condition, and (b) within the high instrumentality condition, the high valence group should exert significantly more effort than the low valence group.

The prediction of a significant three-way interaction corresponding to the pattern of cell means given in Figure 1 leads necessarily to predictions about other effects within the analysis of variance framework. These are described below.

2. All two-way interactions should be significant. For the instrumentality x valence interaction, (a) there should be no differences in effort expenditure between the two levels of valence for subjects in the low instrumentality condition, and (b) within the high instrumentality condition, the high valence group should exert significantly more effort than the low valence group. For the expectancy x valence interaction, (a) there should be no difference in effort expenditure between two levels of valence for subjects in the low expectancy condition, and (b) within

the high expectancy condition, the high instrumentality group should exert significantly more effort than the low instrumentality group.

3. All three main effects should be significant. Subjects working for a high valent outcome should exert significantly more effort than subjects working in a condition in which outcomes do not depend on performance effectiveness. Finally, subjects with a high expectancy should exert significantly more effort than subjects with a low expectancy.

## METHOD

### Subjects

Ninety-seven female undergraduates participated voluntarily in this study. All subjects were students in the introductory psychology course at Purdue University and received course credit for their participation. Of the 97 subjects, data from 89 were used in the statistical analyses. Data from the remaining eight subjects were not included in the analyses because either (1) they expressed open disbelief of performance feedback, or (2) they reported that their behavior during the study was intentionally reactive and thus, unrepresentative.

### Task

The task involved spelling recognition. Each separate task contained 25 lines with three words per line (see Figure 2 for an example of the task). Subjects were instructed to search through the list of words and indicate which words were spelled incorrectly by placing a check within the brackets preceeding the misspelled words.

Subjects were told that performance on this task would be determined by the percentage of lines, not words, which contained no errors. Each time a subject checked a properly-spelled word or did not check an incorrectly-spelled one, the line was considered incorrect. Two or more errors in the same line would only constitute one wrong line.

Performance feedback based on this scoring procedure was provided to subjects. However, all feedback was independent of actual performance. Pilot data indicated this scoring procedure was effective in providing false feedback which was both realistic and believable.

### Experimental Manipulation

Expectancy manipulation. The manipulation of the expectancy term involved

line # 1	( ) Ageing	( ) eror	( ) ambassador
line # 2	( ) fessable	( ) balance	( ) occassional
line # 3	( ) chocolate	( ) inaccurate	( ) ceramic
line # 4	( ) managable	( ) address	( ) nozle
line # 5	( ) justifiable	( ) parlement	( ) lacerate
line # 6	( ) radiant	( ) explative	( ) cabinnet
line # 7	( ) mayonnaise	( ) discrepancy	( ) adhesive
line # 8	( ) buoyancy	( ) rationalize	( ) sherbet
line # 9	( ) lethergy	( ) fiftieth	( ) acclame
line #10	( ) damage	( ) noterize	( ) collapse
line #11	( ) absentee	( ) vertabrate	( ) killowatt
line #12	( ) customary	( ) preamble	( ) reciprocal
line #13	( ) paradox	( ) incidentally	( ) decrease
line #14	( ) tellephone	( ) corruptible	( ) miniature
line #15	( ) exaggerate	( ) nobalman	( ) ridiculous
line #16	( ) fluorescent	( ) replete	( ) determinant
line #17	( ) appetite	( ) hallelujah	( ) loveable
line #18	( ) incredible	( ) depudy	( ) imbicie
line #19	( ) percise	( ) formidable	( ) narrative
line #20	( ) desirable	( ) charaty	( ) adolescence
line #21	( ) delivry	( ) hamgerger	( ) athalete
line #22	( ) suburban	( ) effeminate	( ) mathmatics
line #23	( ) predecessor	( ) nonsense	( ) heighth
line #24	( ) ointment	( ) equidy	( ) congratulate
line #25	( ) advertiser	( ) compulsory	( ) generally

Figure 2: Sample Spelling Task



controlling the relationship between a subject's effort and her performance on the spelling tasks. A high effort-performance expectancy is one for which increasing amounts of effort are associated with increasing levels of performance. Likewise, a low effort-performance expectancy is one for which increasing amounts of effort result in either a constant or random level of performance feedback. Thus, a high expectancy was defined in terms of an effort-performance correlation approaching  $r = +1.0$  and a low expectancy as an effort-performance correlation approaching  $r = 0.0$ .

For purposes of manipulating this variable, effort was operationalized as the total amount of time subjects spent working on a task. Thus, a subject is said to put forth twice as much total effort working on a task for four minutes than when working on an equal length task for only two minutes. This operationalization of effort reflects a commonly-defined attribute of effort—the attribute of duration of behavior.

In order to vary effort, subjects were given six trials with the spelling tasks prior to the experimental trials. Subjects worked on these tasks under time limits of two, three, and four minutes. Two trials were given each of the three time limits. Subjects were instructed to check back over their work if they finished a task before time was called.

In order to vary performance, false feedback was given. Immediately upon completion of a spelling task, "graders" collected the task, ostensibly scored them, and then gave subjects feedback on their performance. The pattern of false feedback given to subjects allowed for the manipulation of the relationship between a subject's effort and her performance on the spelling tasks. Two levels of the expectancy term were experimentally created.

In the high expectancy condition, the pattern of performance feedback was designed to show increasing performance as subjects worked for longer periods of

time. That is, the longer the time limit for the task, the higher the performance feedback. Figure 3 contains a sample feedback sheet for subjects in the high expectancy condition. Statistically, this feedback presented the subjects with effort-performance correlations approaching  $r = 1.00$ . Conceptually, it was hoped that subjects would believe they could affect their performance systematically by varying the amount of time spent working on the tasks.

In the low expectancy condition, the pattern of feedback was designed to present a random pairing of time limits and performance scores. That is, the bivariate distribution was designed to present no systematic linear trends in the feedback data. Figure 4 contains a sample feedback sheet for subjects in the low expectancy condition. Statistically, this feedback presented subjects with effort-performance correlations approaching  $r = 0.00$ . Conceptually, it was hoped that subjects would believe that their performance was unrelated to their effort and thus could not be affected systematically by the amount of time spent working on the spelling tasks.

Two points should be made about the expectancy manipulation. First, pilot research indicated support for the effectiveness of this manipulation using a measure of perceived effort-performance correlations as the criterion. Second, the feedback given to subjects in both high and low expectancy conditions differed only with respect to the pattern of feedback scores. Graders were given the option to adjust the performance feedback within two lines ( $\pm 8$  percent) of the optimal patterns given in Figures 3 and 4. The entire distribution of feedback was raised two lines for exceptionally good spellers and lowered two lines for poorer spellers. Nonetheless, the mean feedback scores given to both conditions were equivalent. Thus, the expectancy manipulation was not confounded by a concomitant task difficulty manipulation.

Instrumentality manipulation. Like the expectancy term, an instrumentality was operationalized as a perceived correlation. Here, the perceived correlation

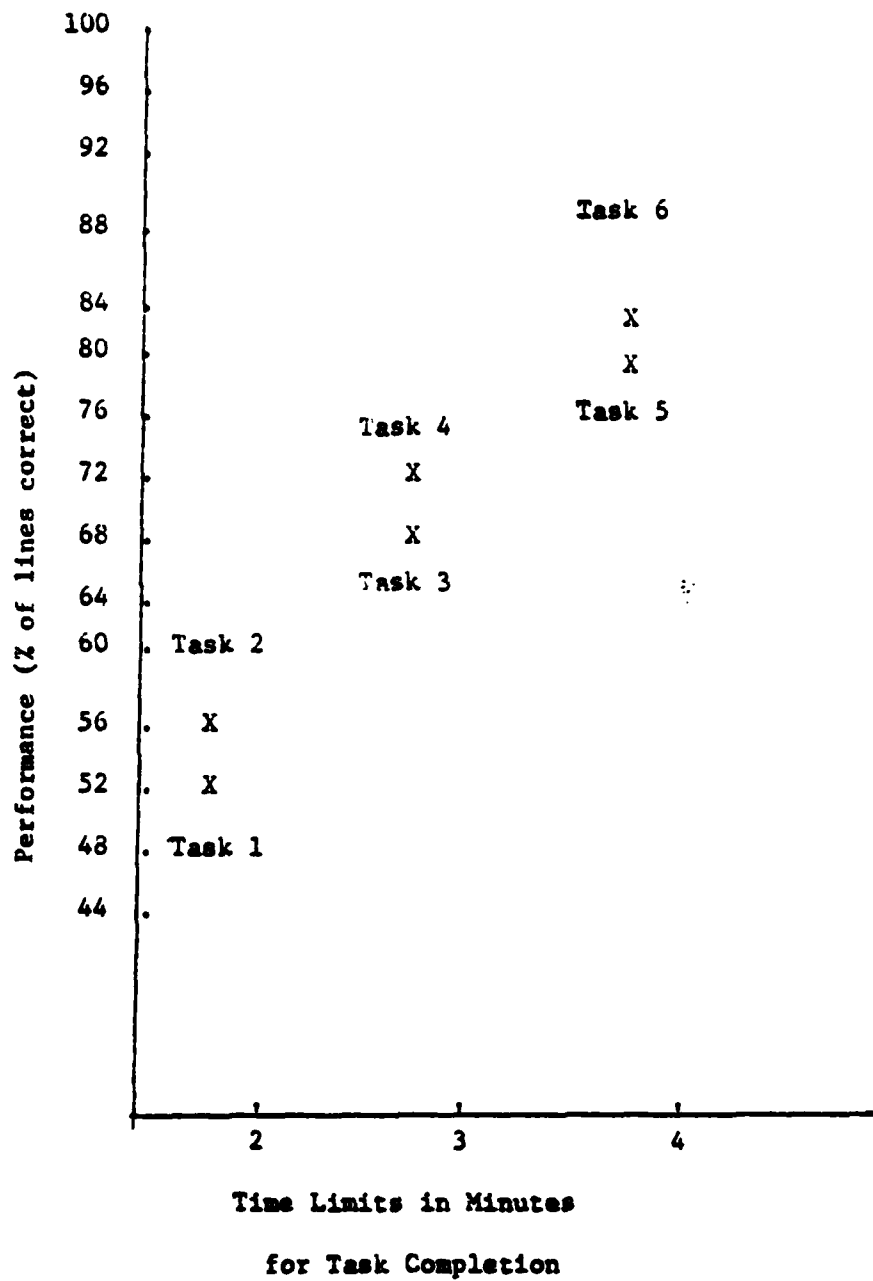


Figure 3: A Sample of Performance Feedback Sheets  
for Subjects in the High Expectancy Condition

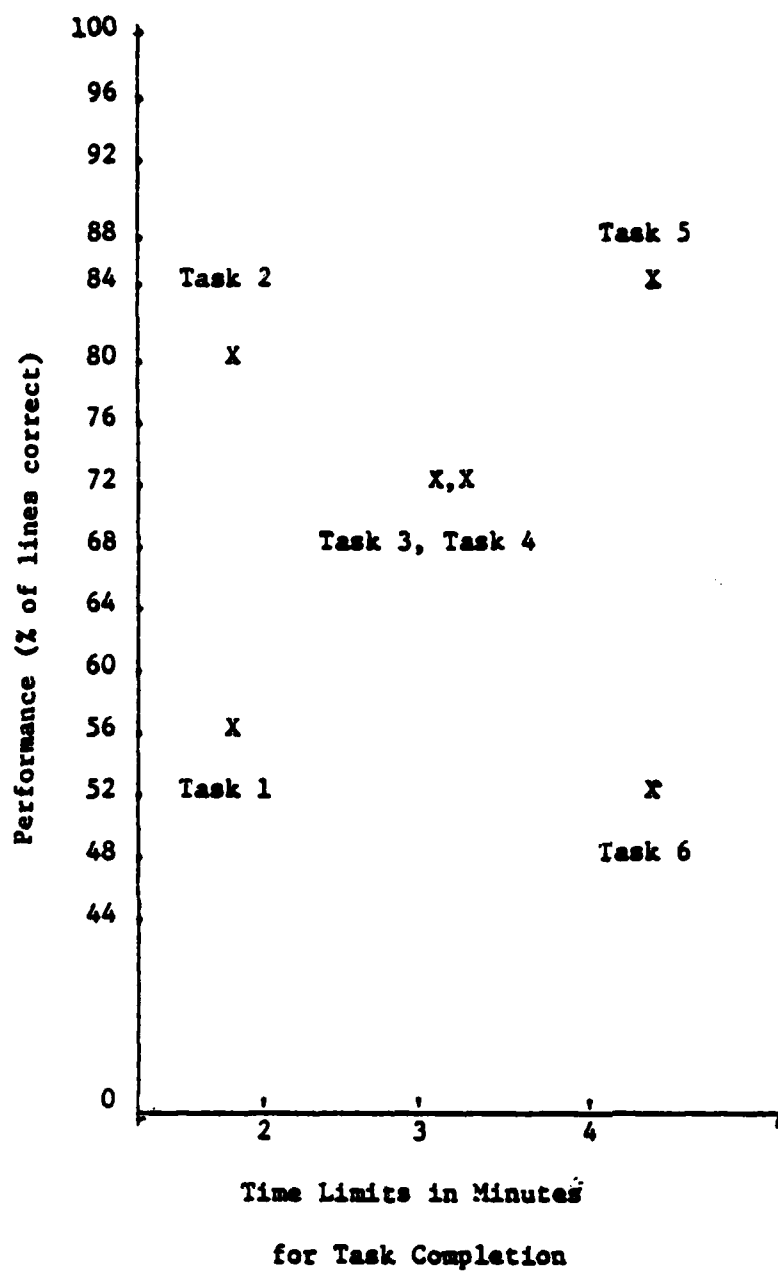


Figure 4: A Sample of Performance Feedback Sheets  
for Subjects in the Low Expectancy Condition

was between one's performance and the receipt of an outcome. In this study, outcomes consisted of stereo record albums. Subjects were informed that approximately half of them would win one stereo record album for their participation in this study and the winners would be determined by a lottery. The manipulation of the instrumentality variable involved controlling the relationship between a subject's performance and her chances of winning a stereo record album. Two levels of this variable were experimentally created, corresponding to performance-outcome correlations which approached  $r = 1.00$  and  $r = 0.00$ .

Following the first six trials, subjects were instructed that they would work on ten additional spelling tasks. In the high instrumentality condition, the receipt of lottery tickets was made contingent on work performance on these ten trials. The following contingency was explained to subjects. For each trial on which they performed at 80% or higher (i.e., had 20 or more lines correct on the 25 line task), they would receive six lottery tickets. For each trial on which their performance fell in the performance range of from 60% to 79% (15 to 19 lines), they would receive three lottery tickets. For each trial on which they fell below the 60% performance score (less than 15 lines), they would receive no lottery tickets. Thus, over the ten experimental trials, the number of lottery tickets earned could have ranged from 60 (high performance on all ten tasks) to zero (low performance on all ten tasks). Subjects were told that the higher their performance, the more lottery tickets they would earn, and that the more tickets earned, the better would be their chances of winning a record album.

In the low instrumentality condition, the performance-outcome correlation was set at zero. The receipt of lottery tickets was made non-contingent on performance. In this condition, subjects received one and only one lottery ticket. Their chances of winning a record album could not be changed by changing their performance.

Valence manipulations. The final variable to be manipulated was the valence of the outcome. As mentioned above, stereo record albums were the outcomes used in this study. Pilot data were collected the previous semester on the desirability of various categories of music. These data indicated a very strong desirability in the population for "Popular" music (e.g., artists such as John Denver, Jim Croce, Helen Reddy, etc.) and an equally prevalent rejection or indifference to "Country/Western" music (e.g., Hank Snow, Tammy Wynette, Marty Robbins, etc.). Based on these data, two levels of the valence term were experimentally created.

In the high valence condition, subjects were told that if they were to win in the lottery, they could choose any stereo album from a long list of Popular music albums as their prize. A list containing a sample of Popular music albums was distributed to emphasize the potential prizes.

In the low valence condition, subjects were told that if they were to win in the lottery, they could choose any stereo album from a long list of Country/Western music albums as their prize. A list containing a sample of Country/Western music albums was distributed to emphasize the potential prizes.

Valence, it will be recalled, refers conceptually to the satisfaction (+1.0), indifference (0.0), or dissatisfaction (-1.0) anticipated to result from obtaining an outcome. In the present study, however, outcomes were chosen such that the valence manipulation would result in positive affect at one extreme and affect approaching indifference at the other. Since the music types chosen for this study varied greatly in terms of their desirability, it was felt that each would elicit divergent affect as potential outcomes. If a person was offered Popular music in the lottery, the affect generated should be positive. A Popular music album, which was desirable in itself, should be desired as a potential outcome because listening to it should result in a satisfying experience. On the other hand, subjects offered a Country/Western album in the lottery should be indifferent to its attainment.

Even though the music was undesirable in itself, subjects had the choice of listening or not listening to it. In this respect, they should not care whether or not they won it, because the unpleasant experience of listening to the Country/Western album did not automatically follow from its attainment. Since subjects could refuse the album, give it away, or even store it on a shelf to collect dust, they should not care whether or not they received it. Thus, neutral affect with respect to obtaining this type of music was expected rather than negative affect.

Subjects were randomly assigned to either the Popular or Country/Western type of music as the outcome available to them in the lottery. Although this was done to manipulate valence, obviously some persons assigned to the Country/Western music outcome liked this type of music and some persons assigned to the Popular music outcome disliked this type of music. For these people, a Country/Western album would be a high valent outcome and a Popular album, a low valent outcome. As a result, subjects were assigned to high or low valence conditions based on the type of music album assigned to them and the desirability of this type of music to them.

In order to assess the desirability of Popular and Country/Western music, each subject completed a questionnaire indicating their own music preferences. This questionnaire was administered at the beginning of the study, before subjects learned which music type they were eligible to win. These data indicated that six subjects assigned to the Popular music condition disliked this type of music. The former subjects were assigned to the high valence condition, and the latter subjects to the low valence condition. All analyses reported in this manuscript involving subjects in the high and low valence conditions were based on this subjective placement of subjects into valence conditions. While this translated this study out of a strict experimental design and into one which involves an organismic variable, it preserves the conceptual meaning of the valence variable.

### Dependent Variables

Expectancy theory formulations of motivation are said to be determinants of work effort. All researchers would agree with this. However, most have used work performance as their major dependent variable, arguing that performance is, in turn, a partial function of effort. In addition, those studies which have used effort as their dependent variable, have relied upon supervisory, peer, self-reports of effort. To date, the published literature on Expectancy Theory contains no study with an objective measure of effort. The present study was designed to provide such a measure.

In the present study, an adjusted duration of behavior measure comprised the objective measure of effort. Duration of behavior on a task can be thought of as major dimension underlying effort. An obvious operationalization of this variable would be to see just how long a person would be willing to work on a task. However, not all people work at the same speed. Some people work at a slow pace; others work very rapidly. If two persons at opposite extremes on this speed of work dimension both took one hour to complete a task, it cannot be concluded that both put forth an equal amount of effort. The slower person may have needed the entire hour to complete the task, while the quicker person would have spent more time than necessary working. One could argue that the quicker person put forth more effort than the slower one in that the quicker person spent more time than needed working on the task. The extra time spent working above and beyond that needed to complete the task would be an indication of that person's greater effort expenditure. Thus, time-on-task measures would not be enough in-and-of-themselves to measure effort. Rather, such time measures would need to be adjusted by normal working speed and would result in the time spent working on a task above and beyond that minimum necessary to complete the task. Such a measure comprised the primary operationalization of effort in this study.



Following the experimental inductions of the expectancy, instrumentality, and valence variables described above, all subjects were given up to one hour to work on a packet containing ten additional spelling tasks. They were instructed that upon completion of the ten tasks, they would complete a short questionnaire and be able to leave the study. The sooner they finished all the ten spelling tasks, the sooner they would be able to leave.

This resulted in a measure of total amount of time spent working. It was felt that time spent working was an individually-determined decision based, at least in part, on motivation.

The time measure was then adjusted by a crude measure of "time necessary" to complete the ten tasks. This measure was derived by assessing how quickly subjects worked on the first two trials (those used in the expectancy manipulation) in order to predict how long they might need to work on all ten experimental tasks.

The first two pre-trials had very short time limits (two minutes each). Very few subjects were able to complete an entire 25 line task within such short time limits. Thus, it was possible to determine how long each subject needed to work on an average line in the spelling tasks. This was done by dividing the total time available for working on the first two tasks (four minutes) by the total number of lines completed on both. The resultant quotient was then multiplied by 25, the number of lines in a standard spelling task. This product represented the predicted time needed to complete one 25-line spelling task. Finally, this figure was multiplied by ten, resulting in the predicted time to complete 10 standard spelling tasks.

The first two pre-trials were used as the basis for arriving at a predicted completion time for the 10 experimental tasks for two reasons. First, subjects did not begin to receive performance feedback scores until after the second task. Thus, their behavior in trials one and two were unaffected by performance feedback. Second, all subjects were given a common frame of reference of "do your best" on

both tasks. There was no reason to doubt that these instructions might act differentially on different persons.

The primary operationalization of effort was the amount of time subjects worked on the set of ten experimental tasks above and beyond the time necessary to complete the set. This derived effort measure was obtained by subtracting the predicted time for completion from the actual time used. The greater the difference score, the greater the effort expenditure. Consider the example below.

Assume Person A and Person B worked 40 and 50 minutes respectively on the set of ten spelling tasks. On the first two trials, Person A completed 40 of the possible 50 lines; Person B completed just 20 lines. Person A would be predicted to need  $4/45 \times 25 \times 10 + 25$  minutes to complete the set of ten experimental tasks. Person B would be predicted to need  $4/20 \times 25 \times 10 + 50$  minutes to complete the same set of tasks. Since Person A actually worked 40 minutes, the derived effort score for Person A would be  $40 - 25$  or 15 minutes. For Person B, the effort score would be  $50 - 50$  or 0 minutes. Thus, Person A worked a total of 15 minutes longer than predicted to complete the ten tasks while Person B worked only as long as predicted on them. Even though Person B spent more total time working, Person A is said to have exerted greater effort than Person B. Effort was operationalized in this manner for all subjects and constituted the primary dependent measure for this study.

In addition, subjects responded to two rating scales dealing with their effort expenditure. Subjects indicated how hard they worked on a nine-point rating scale with extreme anchors of "not at all" (1) and "as hard as I could" (9). The second item asked subjects to indicate how much effort they exerted on a nine-point scale with extreme anchors of "90% effort" (9) and "10% effort" (1). Since these two items were so highly correlated ( $r = .68$ ,  $p < .001$ ), they were averaged, resulting in one measure of self-rated effort. This self-rating of effort, in addition to the objective effort measure, was used to test the hypotheses of this research.

### Procedure

Subjects reported to the experimental sessions in groups of from eight to 15 persons. These sessions lasted up to two hours, depending on how quickly subjects finished the experimental tasks. In addition, all subjects met a second time as one large group for a debriefing session and for the announcement of record winners.

Upon arrival, subjects were assigned seats spaced throughout a large room to prevent them from seeing each other's work. Subjects were then given a short questionnaire to complete. This questionnaire asked them to indicate their preferences for each of seven types of music, two of which were Popular and Country/Western music. The experimenter then explained that the purpose of the study was to assess persons' perceptions to simulated work conditions. The spelling tasks were introduced with a discussion of how to make responses to misspelled words and how performance would be determined. Written examples of each were provided on the blackboard.

It was explained to the subjects that, before they began their "job", it was important that they have some experience with it. This was done by administering the initial six trials of the tasks. These six timed trials with the performance feedback comprised the expectancy manipulation.

Each trial was scored and performance feedback was given to the subjects. Scoring was done by graders who assisted the experimenter. Each grader's responsibilities included scoring the tasks, recording scores on a specially prepared feedback sheet, and providing feedback to two subjects. Each task was scored immediately upon its completion while subjects worked on the next task. Between trials, graders collected the task just completed and distributed the performance feedback sheets. After subjects had an opportunity to review their performance, the feedback sheets were returned to the graders who then distributed the next task. Following the sixth task, subjects completed two short personality scales. These were filler tasks used to give graders time to complete scoring of the sixth trial and return the feedback to the subjects.

Graders were provided with transparent templates to facilitate scoring. While all graders actually scored the spelling tasks, in all cases false feedback was given. As explained previously, the false feedback was provided to induce beliefs of either high or low expectancies. Since the subjects received the performance feedback on a separate sheet and did not get the actual spelling tasks back, they were never presented with an inconsistency between the number of lines correct and their feedback scores.

Following the expectancy induction, all materials were collected and the graders dismissed. At this point, a more detailed explanation of the experimental procedures was given by the experimenter. This explanation included specific instructions about the record lottery and its procedures and thus, constituted the instrumentality induction.

It should be pointed out that subjects were run in homogeneous expectancy and instrumentality groups. This was done to facilitate the conduct of the experiment. Expectancy and instrumentality conditions were randomly assigned to experimental sessions. Subjects, unaware of experimental treatments, signed up for sessions on the basis of personal convenience, and thus, randomly assigned themselves to conditions.

The valence manipulation was then conducted. Subjects were randomly assigned to valence conditions during the experimental sessions. They were told that winners in the record lottery would have their choice of albums as a prize, but the choice would be limited to one type of music. This was explained by stating the necessity of purchasing albums in a wide range of music categories due to the arrangements made with the record distributor and the need for a highly discounted price for the albums. The experimenter then handed each subject a sheet containing both the name of one music category and a sample of albums from which they might choose if they were a winner in the lottery. Subjects were told each sheet contained one of seven types of music and that the determination of who received each type was a random event. In fact,

only music sheets in either the Popular or Country/Western music categories were distributed. This distribution was random. Thus, subjects were randomly assigned to homogeneous expectancy and instrumentality conditions as a group, and within each group, to either the high or low valence condition.

Following all experimental inductions, subjects completed a short questionnaire designed to check on the effectiveness of the experimental manipulations. Once completed, instructions for the experiment continued. Subjects were told they would work on ten additional spelling tasks, each similar in length and difficulty to the ones on which they had previously worked. They were instructed to work on all ten tasks, and, when satisfied with their work, to hand in their materials to the experimenter. They were told that whenever they had finished with the ten tasks, they would be given a short post-experimental questionnaire and allowed to leave. Materials were then distributed and subjects allowed to begin their work. As each subject finished work on the experimental tasks, the time was recorded, the materials were collected, and a post-experimental questionnaire distributed. Upon completion of the questionnaire, they were thanked for their participation and reminded of the second meeting of the study.

Each session contained a subject who was a confederate. The confederate was instructed to participate fully in the experiment. Her major job was to work on the set of ten experimental tasks for 20 minutes, at which time she was to turn in her work to the experimenter and pick up a post-experimental questionnaire. She then was to return to her seat and work on this questionnaire for an additional 15 minutes. When completed, she turned in her materials and left the room. She was used to model two types of behaviors. First, she demonstrated that it was legitimate to stop working on the task before the hour was up. Second, she demonstrated her willingness to spend a considerable amount of time responding to the post-experimental questionnaire.

## Results

### Manipulation Checks

An attempt was made to check on the effectiveness of the experimental manipulations by a short questionnaire administered after all inductions had taken place. Subjects responded to three questions designed to measure the success of the manipulations. One item was written for each of the experimental manipulations.

To check the expectancy manipulation, subjects were asked to choose one of two statements which best described the relationship between their performance on the initial six trials and the amount of time they spent working on them. The first alternative read, "My performance seems almost random and unpredictable, regardless of the time I spend working on the spelling tasks." The second alternative read, "My performance gets higher and higher as I spend more and more time working on these spelling tasks." Responses were coded one and two respectively for these alternatives. The mean response to this item for subjects in the high expectancy condition was 2.00, and for subjects in the low expectancy condition, it was 1.13. This difference was highly significant ( $F = 299.99$ ;  $df = 1/81$ ;  $p < .001$ ). The expectancy manipulation was highly effective. One item with two alternatives also was used to check the instrumentality manipulations. The first alternative read, "My chances of winning record albums remain the same regardless of how high or low I perform on the spelling tasks—that is, I cannot increase my odds of winning record albums." The second alternative read, "My chances of winning record albums get better and better as I increase my performance on the spelling tasks—that is, I can increase my odds of winning if I can increase my performance." The responses were coded one and two respectively for these alternatives. The mean response to this item for subjects in the high instrumentality condition was 1.88, and for the low instrumentality condition, it was 1.06. The difference between these means was highly significant ( $F = 161.57$ ;  $df = 1/81$ ;  $p < .001$ ), demonstrating the effectiveness of the instrumentality manipulation.

For the valence manipulation, subjects were given a list of seven music categories and asked to indicate the one type of music from which they were to choose if they were a winner in the lottery. Subjects were classified as making a correct or incorrect indication of the outcome available to them. Of the 42 subjects who were offered Popular music as the outcome available in the lottery, 32 correctly identified this music category while ten subjects indicated albums in other categories. Of the 47 subjects offered Country/Western albums, 38 correctly identified this music category while five choose Popular music and an additional four subjects chose albums in other categories. Chi-square ( $\chi^2$ ) analyses were performed separately for each of the two types of music used in the study. For these analyses, a fourfold table was defined by "receipt/non-receipt" of the outcome "did choose/failed to choose" the outcome. For the Popular music outcome, the  $\chi^2_{(1)} = 39.24$ . For the Country/Western outcome, the  $\chi^2_{(1)} = 59.25$ . Both  $\chi^2$ 's were highly significant ( $p < .001$ ). These data support the contention that subjects were aware of the music type offered to them in the valence manipulation.

#### Tests of the Predictions

The first hypothesis concerned the causal effects of the manipulation of Expectancy Theory variables on work effort. Two analyses are reported to test this hypothesis. The first employed the derived effort score as the dependent variable and the second used the self-rating of effort as the dependent variables. Each analysis used a  $2 \times 2 \times 2$  Analysis of Variance with factors and level corresponding to the manipulations of the major Expectancy Theory variables described earlier. The variance estimates were based on the Eta-squared ( $\eta^2$ ) statistic (Hays, 1963).

The basic data for this hypothesis are presented in Tables 1 and 2 and in Figure 5. Table 1 contains means and standard deviations for both measures of effort under each treatment condition, and Figure 5 displays these means graphically. Table 2 summarizes the analyses of variance for both dependent variables.

Table 1: Means and Standard Deviations for the  
Objective and Subjective Effort Measures

Treatment Condition				Effort Measures			
Expectancy	Instrumentality	Valence	N	Derived Effort	Self-Rated Effort		
				$\bar{X}$	S.D.	$\bar{X}$	S.D.
Low	Low	Low	13	3.57	4.10	6.85	1.70
Low	Low	High	10	7.22	7.33	7.10	1.66
Low	High	Low	8	7.89	4.93	6.56	1.52
Low	High	High	17	9.22	6.35	6.06	1.06
High	Low	Low	9	9.26	11.59	7.22	.97
High	Low	High	9	9.10	5.48	6.89	.78
High	High	Low	13	8.01	6.53	6.31	1.94
High	High	High	10	14.93	4.71	7.75	.86



Table 2: Analysis of Variance Summary Tables for the  
Objective and Subjective Effort Measures

Source	DF	Dependent Variables					
		<u>Derived Effort</u>			<u>Self-Rated Effort</u>		
		MS	F	E <sup>2</sup>	MS	F	E <sup>2</sup>
Expectancy (E)	1	236.29	5.43**	.05	3.37	1.86	.00
Instrumentality (I)	1	156.03	3.58*	.03	2.50	1.38	.00
Valence (V)	1	181.38	4.17**	.03	.97	1.00	.00
E x I	1	4.03	1.00	.00	2.13	1.18	.00
E x V	1	4.19	1.00	.00	2.43	1.34	.00
I x V	1	30.01	1.00	.00	1.36	1.00	.00
E x I x V	1	116.10	2.67*	.02	8.44	4.67	.04
Error	81	43.54			2.73		

\*  $p < .10$

\*\*  $p < .05$

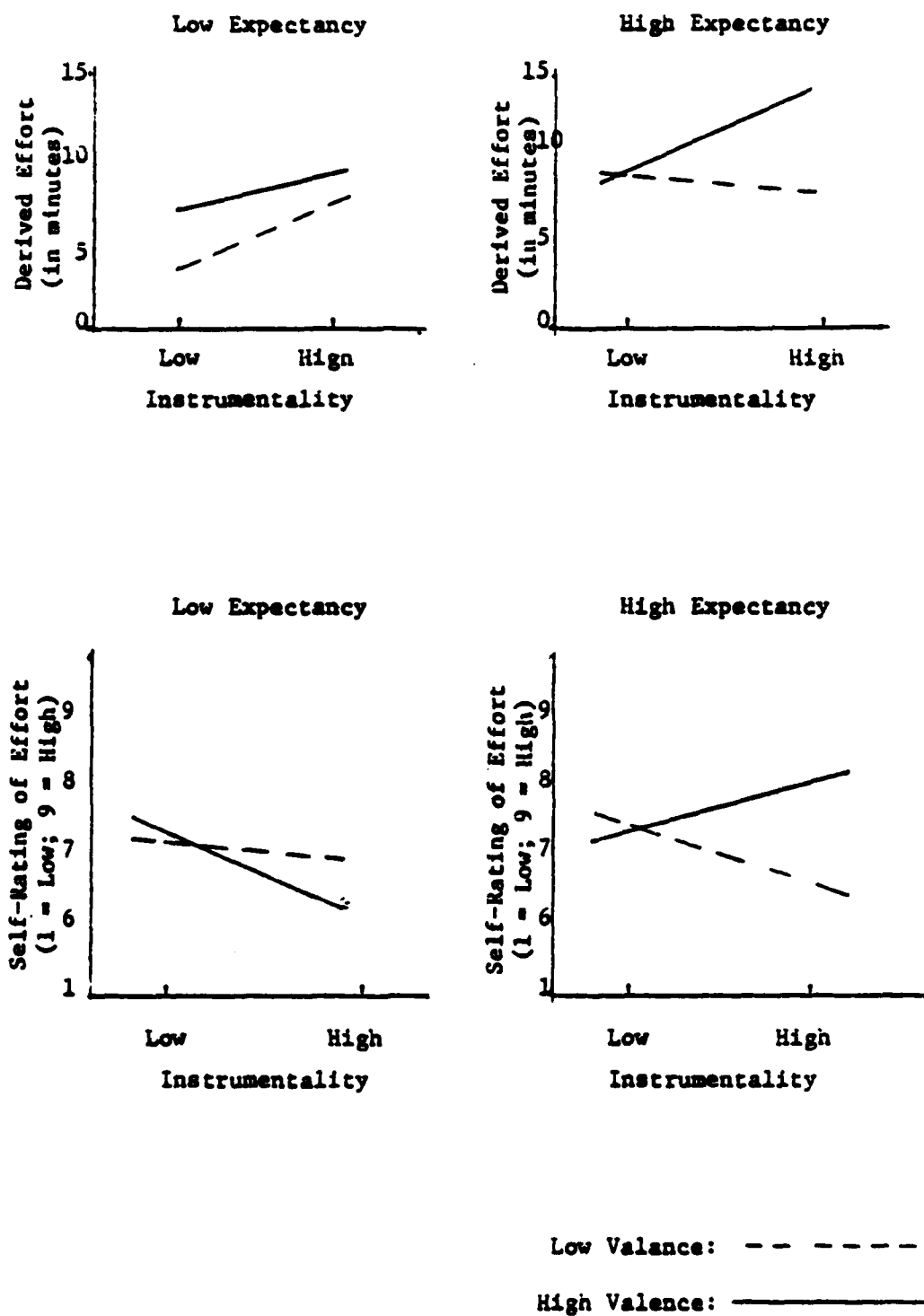


Figure 3: Effort Means by Treatment for Derived Effort Score and Self-Rating of Effort as Dependent Variables.

For the dependent variable of derived effort, main effects were observed for expectancy and for valence. As predicted, subjects in the high expectancy condition spent significantly more time on the task than was necessary in comparison to those subjects in the low expectancy condition ( $\bar{X}_{\text{high E}} = 10.33$  minutes;  $\bar{X}_{\text{low E}} = 6.98$  minutes;  $p < .05$ ). Likewise, subjects in the high valence condition worked significantly longer than subjects in the low valence condition ( $\bar{X}_{\text{high V}} = 10.12$  minutes;  $\bar{X}_{\text{low V}} = 7.18$  minutes;  $p < .05$ ). The main effect for the instrumentality variable and the three-way interaction both approached traditional levels of statistical significance ( $p < .06$  for the instrumentality main effect and  $p < .10$  for the three-way interaction). The pattern of means for both effects was in the predicted direction. Finally, none of the two-way interactions was significant.

Figure 3 shows that the data generally conform to the predictions made about the pattern of cell means for the three-way interaction, with the exception of the cell in which all three variables were set at their "low" level. The three-way interaction was predicted to occur because of the significantly greater effort exerted by subjects in the cell with "high" levels on all three variables as compared to subjects in all other conditions. It also was predicted that the remaining seven cells would not differ significantly from each other. These predictions were tested using the method of planned comparisons (Hays, 1963). While subjects in the High E - High I - High V condition did spend significantly more time working on the spelling tasks than subjects in the other seven cells ( $t = 2.55$ ;  $df = 81$ ;  $p < .01$ ), the latter prediction was not supported. Subjects in the Low E - Low I - Low V condition spent significantly less time working than all other subjects ( $t = 2.09$ ;  $df = 81$ ;  $p < .05$ ).

While the predicted interactions did not occur, it should be noted that the general pattern of these data conform to the predictions. High E - High I - High V subjects worked significantly longer than Low E - Low I - Low V subjects with cell means for the other conditions between these extremes. Subjects in the High E - High I - High V

condition worked from one and one-half to over four times longer than was needed for them to complete the task than did subjects in the other seven conditions. The effects reported accounted for 13 percent of the variance in the derived effort measure.

For the subjective rating of effort expenditure, only the three-way interaction was significant ( $p < .05$ ). As before, the pattern of cell means generally conformed to predictions. The simple instrumentality  $\times$  valence interaction was non-significant for subjects in the low expectancy condition ( $F < 1.00$ ;  $df = 1/81$ ; n.s.) and was significant for subjects in the high expectancy condition ( $F = 4.36$ ;  $df = 1/81$ ;  $p < .05$ ). Further, the simple-simple main effects comparing subjects in the high and low valence conditions were non-significant at the low instrumentality level ( $F < 1.00$ ;  $df = 1/81$ ; n.s.) and significant at the high instrumentality level  $X_{\text{High } V} = 7.75$ ;  $X_{\text{Low } V} = 6.31$ ;  $F = 6.50$ ;  $df = 1/81$ ;  $p < .05$ ). That is, subjects who received the high valent outcome while working under the high expectancy-high instrumentality conditions, reported that they exerted significantly more effort than their low valence counterparts.

In spite of the pattern of cell means, this three-way interaction accounted for only four percent of the response variance. Therefore, only moderate support can be concluded for the hypothesis.

In summary, the hypothesis that effort is causally related to Expectancy Theory variables, was supported. The data presented clearly are stronger for the objective measure of effort than for the self-ratings of effort. However, in both cases, the pattern of cell means generally conformed to predictions.

#### Discussion

The results of the present investigation, across both dependent variables, are supportive of the notion that Expectancy Theory variables are causally related to work behavior. These results are clearly stronger for the objective measure of effort than for the self-report measure. For the measure of persistence of behavior beyond

that needed to complete the task, not only were two of the three main effects significant and the third nearly so, but the pattern of the cell means strongly conformed to the predictions. This latter conclusion is supported by the results of the simple effects analyses. On the other hand, for the effort rating, only the general pattern of cell means conformed to predictions. The simple effects analyses on the three-way interaction did support this conclusion of a proper patterning of these cell means.

Based on these data, it would seem that subjects in a low expectancy situation were unwilling to exert effort, while those subjects in a high expectancy condition were willing to do so only when a high instrumentality - high valence situation also was present. That is, as Expectancy Theory predicts, these data indicate that the necessary condition for high effort expenditure to be chosen is one in which increasing effort can result in increasing higher levels of performance, and increasing performance can raise the probability of attaining valued outcomes. Therefore, this investigation provides evidence that objective effort-performance and performance-outcome contingencies and the desirability of obtaining one outcome do exert causal influence on behavior. As such, it adds to the growing body of literature supporting Expectancy Theory predictions about work efforts.

One issue raised by these data concerns the measurement of the dependent variable, effort. The manipulation of expectancies, instrumentalities, and valences had a stronger effect on the objective measure of effort than on the subjective measure of effort. A possible explanation for this inconsistency is that the objective and subjective measures were not measuring the same aspects of effort. Effort is a multi-dimensional construct. At the least, the aspects of intensity of behavior and persistence of behavior can be attributed to this construct (Jonas, 1955). The objective measure was designed to assess the persistence dimension of effort. It seems plausible that the questionnaire ratings elicited reactions to not only this aspect of effort, but further, to the intensity of behavior aspect. That is, the two measures were convergent on only one dimension of the effort construct.

Consider the example of two factory workers, one of whom continues to work on each task until a very high standard of quality is reached and the other who stops working on each task when minimal standards are achieved. An effort measure designed to reflect persistence of behavior should reflect this difference. However, if a global assessment of effort expenditure were taken, these persons might report equally high effort expenditure. In responding to the global assessment (e.g., a rating of the total amount of effort exerted), factors such as working long hours each day, feeling tired and sweaty at the end of each day, having aching muscles, and so forth may be considered in addition to the persistence dimension. Thus, many aspects of effort expenditure may be considered in self-reports of effort expenditure when the items are of a global nature.

Given this argument, the stronger effects observed using the objective effort measure can be explained by noting the experimental manipulation of the expectancy variable. As will be recalled, this involved manipulating the relationship between effort and performance. For this purpose, effort was operationalized in terms of a time dimension and varied by allowing subjects different time limits to work on the initial six spelling tasks. That is, this variable was manipulated by controlling the relationship between persistence (effort) and performance. Thus, it is reasonable that the greatest effects should result with a purely time-based dependent variable.

This argument suggests that Expectancy Theory predictions need to be explicit with respect to the "type" of effort they try to predict. It seems unwise to use a global assessment of effort as a dependent variable. Such a procedure could easily mask relationships to Expectancy Theory variables which might be observed by knowing which dimension of effort is operative in the given situation.

This conclusion is, of course, speculative. While the pattern of correlations among the dependent variables cannot confirm this contention, they, at least, are as would be expected if this argument is correct.

The correlation between the objective measure of effort and the two subjective ratings were  $r = .34$  and  $r = .33$  ( $p < .001$  for both). At least, some of the variance in the ratings is in common with the variance in the persistence measure. Further, the correlation between the two self-ratings of effort was  $r = .68$  ( $p < .001$ ). The high correlation between these ratings may mean they converge on the effort construct. Likewise, it may mean that response bias resulting in common method variance is operative. Neither alternative is testable from the data. However, at least some of the variance in the ratings converged on the persistence aspect of effort. It cannot be ruled out that additional variance in the ratings tapped effort along different dimensions. In all, this pattern of correlations among the three measures of effort conforms to what might be expected if the self-ratings measured several dimensions of work effort, one of which was assessed by the objective measure.

In conclusion, the data from the present study support the notion that Expectancy Theory variables are causally related to effort. As the theory predicts, subjects in this study were only willing to work longer than needed to complete a task under a specific condition. This condition was defined experimentally as one in which increases in effort were associated with increases in performance and increased performance resulted in the greater likelihood of attaining a valued outcome. These data, thus, add to the growing body of literature which supports Expectancy Theory predictions. Of note, this effect occurred only when the dependent variable was the specific dimension of effort used in the experimental manipulation of the expectancy variable. Global measures of effort were insensitive to the manipulations. These data suggest that future research must specify the particular dimension of effort which is operative in the work setting.

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